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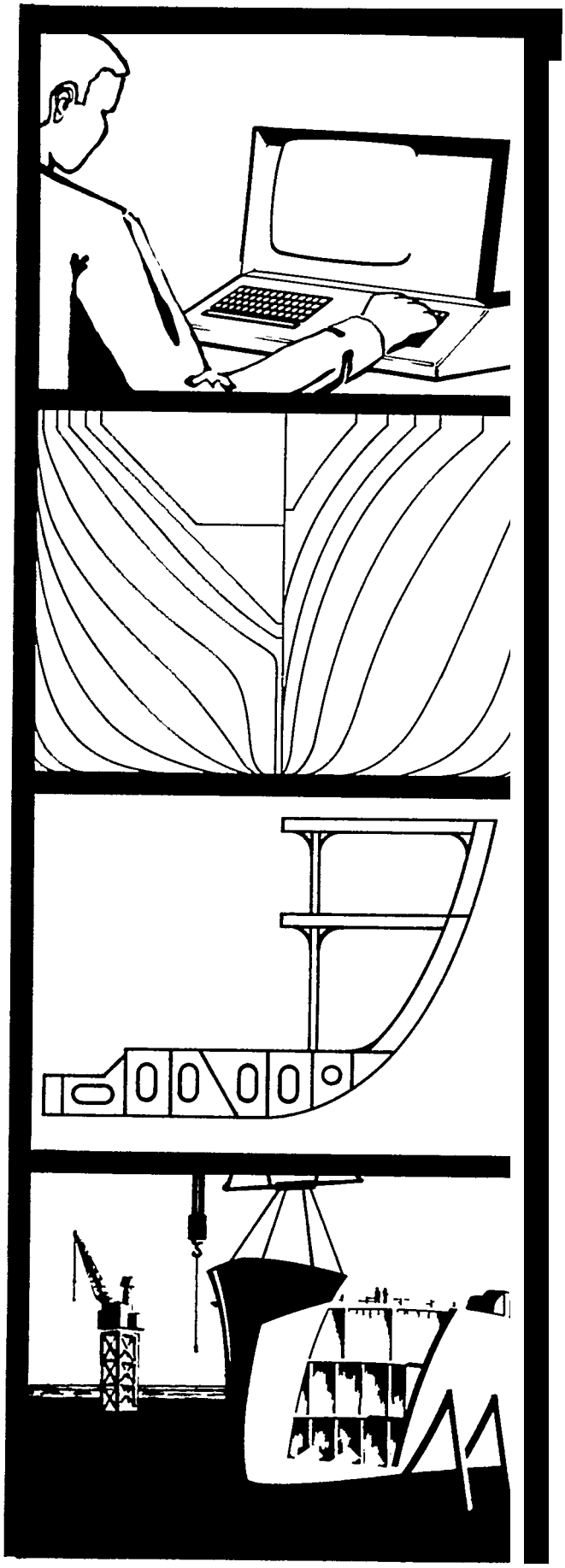

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USER GUIDE TO INTERACTIVE LINES GENERATION (HULGEN) WITH A STORAGE TUBE

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1.0 INTRODUCTION

Given the very minimum input of length, beam, draft, prismatic and midship section coefficients, LCB, LCF, and a deck at edge definition; HULGEN computes all of the initial parameters and control curves required to produce a body plan. This body plan is not the one desired, but provides a starting point for any variations the user wants to make.

The SHIP HULL FORM GENERATOR (HULGEN) uses a piecewise polynomial development and representation of an early stage design ship's body plan. It was originally written for refresh. graphics scopes with light pens. Those earlier versions of the program, although done for light pen picks, operated in a way that made conversion to storage tube graphics very practical. The displays were changed very little and the interactive light pen picks were converted to keyboard entry menus. The user now types a menu option and/or data to proceed.

HULGEN was developed specifically for the early stage design problem of developing many optional hulls rapidly. At this point in the design it is important to be able to determine whether the desired hull form can be developed from the gross dimensions and form coefficients available. Hull form generation is distinguished from hull lines fairing in that the output is a visually smooth body plan which meets the desired ship dimensional parameters. The various control curves and resulting body plan are mathematically smooth but not fair in the traditional sense.

2.0 GENERAL DESCRIPTION

A detailed description of the mathematical development, computer programming, and program operation can be found _in references 1 and 2.

Essentially, HULGEN provides the capability to produce a station cut of offsets at any point from the tip of the bow to the aft perpendicular. These cuts are produced by three polynomials. A third order polynomial is used to produce the offsets from the main deck at edge to load waterline. The offsets from the load waterline to the flat of bottom are produced by a specially developed fourth order polynomial for fine sections and by a bilge radius circle for full stations. As the program progresses from fine sections to full it adjust for the transition from one type curve to the other. It should be noted that this is not just a wire frame body plan, but one where every point on the surface is uniquely defined and can be computed with the appropriate station waterline intersection.

HULGEN produces only a set of molded lines representing the hull above the baseline. It will, handle a variety of bow, flat of bottom, keelrise,, and stern configurations, and a bulbous bow. It must be kept

in mind that HULGEN was developed by and for U.S. Navy type hulls. It has been used on the full gamut of "conventional" Navy hull forms for several years.

The body plan is produced from the following control curves:

Section area
Flat of bottom or halfsiding .
Load waterline
Main deck at edge
Profile
Deadrise slope
Load waterline slope
Main deck at edge slope

These curves are made up of one or more polynomials selected especially to represent the particular curve over a specified length of the hull. The section area and load waterline curves polynomial representations can be modified by the application of tension factors along their length. This feature was added to the program about two years ago to provide more flexibility to the user in the development of the hull .

HULGEN INPUT

The input is divided into the following three groups:

1. HULLFORM PARAMETERS - The dimensional parameters and hull form coefficients described in paragraph one of the introduction and the review'. hull 'input frame (3.4). This data is prepared by the user.

2. BOUNDARY CONDITIONS 1 - The points, slopes, coefficients, and other data required by the program to produce the control curves and the body plan. These are initially produced by the program and become the interactive parameters.

3. BOUNDARY CONDITIONS 2 - Input/output/display control and additional hull form parameters and boundary conditions resulting from modifications and additions to the program. This data is also initially generated by the program and becomes interactive input.

The "punch BND COND 1 + 2" output punches a complete set of the above data which can be used to recreate the body plan and control curves for any future use.

3.0 RUNNING THE PROGRAM

To run HULGEN, the user prepares a set of hull form parameters or obtains an existing data set and loads them on the computer. He then logs onto the system and attaches the HULGEN program and the data file.

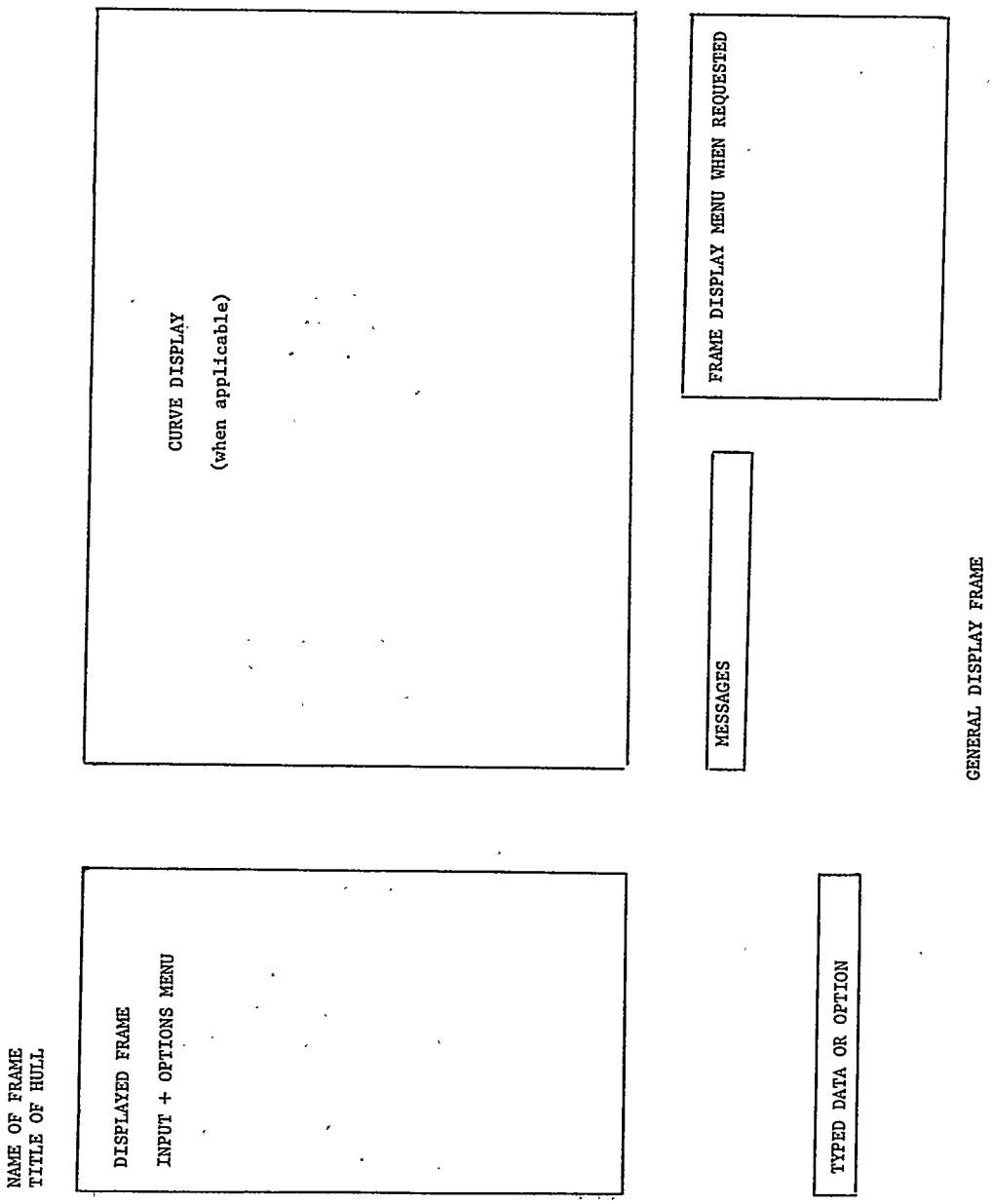


FIG. 3.0 GENERAL DISPLAY FRAME LAYOUT

After this, the first frame appears on the scope and user selects the desired option. Usually, the first option would be the display of the body plan from which a determination is made as to which control curve needs modification.

The following section of the paper gives a description of each display frame, its interactive input options and a sample picture of the frame.

When selecting an option from the frame display menu, only the first two characters of the name are required.

To change interactive data on the currently displayed frame, type in as many (option number, data value) pairs as desired and RETURN.

3.1 HULL FORM GENERATOR FRAME

This is the first frame that appears when the program begins execution. This frame provides space for advertising and space for miscellaneous messages to users.

To exit from this frame and continue to the Review Input,.Data,Frame... hiT RETURN.

For Experienced Users:

It is possible to save a little time by typing in the read options for the review input frame before actually entering the frame.

Example: Type 2, 1, 3, 1 and RETURN will cause reads of hull form data (automatic), boundary conditions 1, and boundary conditions 2. A RETURN alone gives only the automatic read hull form data option.

3.2 MENU OPTION - MENU

On all frames - Type menu or M to get prompter message for the various frames and options.

The menu option prints a list of the display frames available in the program. This list can be produced at any time by typing “menu” or “M”. A shift from the current frame to another frame makes the list disappear.

The next page shows this option as requested from the hull form generator frame.

3.1 HULL FORM GENERATOR FRAME

HULL FORM GENERATOR
ADVANCED DESIGN BRANCH

CODE 61148

NAVAL SHIP ENGINEERING CENTER

IN CASE OF PROBLEMS - CONTACT

FOR HELP T'fPE - RENU

HULL FORM GENERATOR
ADVANCED DESIGN BRANCH

CODE 6114B

NAVAL SHIP ENGINEERING CENTER

IN CASE OF PROBLEMS - CONTACT

FOR HELP TYPE - MENU

MENU
MENU

FOR	TYPE
REVIEW INPUT DATA	DATA
REVIEW HULL INPUT	INPUT
REVIEW SA CURVE	AREA
REVIEW DWL CURVE	DWL
REVIEW DKEDGE CURVE	EDGE
REVIEW PROFILE CURVE	PROF
REVIEW BOTTOM CURVE	FLAT
REVIEW SLOPES-DWL	SWSLP
REVIEW SLOPES-DEADRS	SDSLP
REVIEW SLOPES-DKEDGE	SESLP
REVIEW BODY PLAN	BODY
REVIEW OUTPUT OPTION	OUT
REVIEW TENSOR AREA	TAREA
REVIEW TENSOR DWL	TDWL
PROGRAM STOP	STOP
RESTORE OLD CURVE	OLD
CHANGE TITLE	TITLE

3.3 REVIEW INPUT DATA - DATA FRAME

The input data file can be manipulated so that the user can search for records representing hull form and boundary condition data required for a particular application. A read of a particulaR data type (1, 2, or 3) simply picks up the next data set in the file of that type.

Definitions for Frame - Review Input Data

1. READ HULL FORM DATA (HFP)

   Upon entering this frame for the first time, the first set of hull form data is read in automatically. At this point the user can display the body plan if desired. NOTE: If this is the first use of the HFP data,type "BODY" to have the program generate the boundarry condition data for you. It is a good idea to display all of the control curves at this time to assure that all coefficients have been computed. Set this option to 1 (type 1, 1) to activate the second and subsequent hull form parameter reads from your data file. The program returns 99.000 upon successful completion. It returns 1.0 when no data record of this type is found in file.

2. **READ BND COND No. 1 (Bcl)

   This data will have been created by an earlier run of HULGEN. Set to 1 to activate. Returns 99.000 upon successful completion. Returns 1.0 when data record is not found in data file. When running HULGEN, you should periodically "punch BND CND 1 + 2" (see output options frame) to save this data in case a restart is necessary. **CAUTION- When reading boundary conditions, check the title to make sure it matches your hull form parameters title. If the data file does not contain boundary condition values for your hull form parameters, this option will simply read the next available set.

3. **RED BND COND No. 2 (BC2)

   These boundary conditions are unique to the new version of HULGEN. Running without this data record makes the program behave like the old HULGEN program. This data defines station locations, points per station, and bow and stern boundary conditions.

   Set to 1 to activate. Returns 99.000 upon successful completion. Returns 1.0 when data record is not found in data file. **CAUTION - Same as above.

4. NOT USED

5. NOT USED

6. REWIND INPUT FILE

```
REVIEW INPUT DATA
MCM  N.2  14 DEC 77
1. READ HULL FORM DATA  99.000
2. READ BND COND NO 1   0.
3. READ BND COND NO 2   0.
4.                      0.
5.                      0.
6. REWIND INPUT FILE    0.

2,1,3,1
```

FIG. 3.3.1 REVIEW INPUT DATA FRAME

```
REVIEW INPUT DATA
MIKE/ROD TEST PROB        8/4/7
1. READ HULL FORM DATA  99.000
2. READ BND COND NO 1   99.000
3. READ BND COND NO 2   99.000
4.                      0.
5.                      0.
6. REWIND INPUT FILE    0.
```

FIG. 3.3.2 REVIEW INPUT DATA FRAME WITH RESULTS

```
REVIEW INPUT DATA
MIKE/ROD TEST PROD        8.4/
1. READ NULL FORM DATA 99.0000  99.000
2. READ BND COND NO.1   99.000
3. READ BND COND NO 2   99.000
4.                      0.
5.                      0.
6. REUIND INPUT FILE    0.

APEAI
```

FIG. 3.3.3 REVIEW INPUT DATA FRAME WITH TRANSFER TO AREA

Set to 1 to activate. Returns 99.000 upon successful completion. The user may rewind the input data file at any time. If a rewind is specified, along with other reads. The rewind is performed first before the requested reads. The rewind is not always necessary. The program searches end around thropgh the file. This means that if a data record is not found before the end of file is reached, the file rewinds and begins to search through the file again. The program searches the file twice for a particular data record. When a data record is not found, the value returned is 1.000 instead of 99.000 for the particular requested read option.

The particular option can be selected by typing in the identification number of the option selected, a comma, and a 1. Two or more options can be strung together by typing a comma and another pair of numbers for identification and option setting 1.

Examples:

2, 1	Read BND COND No. 1
2, 1, 3, 1	Read BND COND No. 1 and
	Read BND COND No. 2
1, 1, 2, 1, 6, 1	Read HULL FORM DATA and
	Read BND COND No. 1 and
	REWIND INPUT FILE

NOTE : REWIND INPUT FILE, when requested, occurs before any concurrent read options.

A 99.000 is returned when the option selected is successfully executed.

A 1.000 is returned when the option cannot be executed, i.e., no data record is available for option selected.

3.4 REVIEW HULL INPUT - INPUT FRAME

This frame presents the hull form data record currently in use by the program. The user can review and alter any or ,all data presented by the program.

Definitions for Frame - Hull Form Parameters

1. LEN BET PERPENDICULAR

The length between perpendiculars (dimensional)

2. BEAM AT STA MAX AREA

The beam on the design waterline at the station of maximum area (Dimensional)

3. DRAFT

Draft of ship at station of maximum area (dimensional)

4. MAX SECT COEF

Maximum section coefficient, CX (non dimensional)

5. DEPTH - STA O

Depth from keel line to sheerline at station 0 (dimensional)

6. DEPTH - STA 3

Depth from keel line to sheerline at station 3 (dimensional)

7. DEPTH - STA 10

Depth from keel line to sheerline at station 10 (dimensional)

8. DEPTHh - STA 20

Depth from keel line to sheerline at station 20 (dimensional)

9. NOT USED

10. NOT USED

11. NOT USED

12. HALF SIDING WIDTH

Width of half siding (dimensional)

To alter a data value or several values at once, proceed as follows:

Type in the identification number of the data value - located to the left of the alphanumeric description of the value, a. comma, and the new value. We will call this the ID, value pair. Several values can be changed simultaneously by continuing to type in ID, value pairs separated by commas. The maximum number of values the program will tolerate is 5 value pairs at a time.

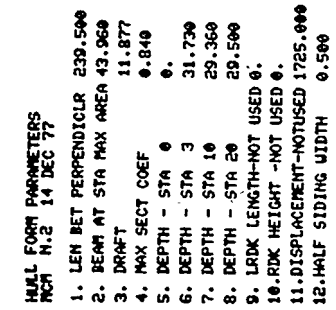


FIG. 3.4.1 HULL FORM PARAMETERS FRAME

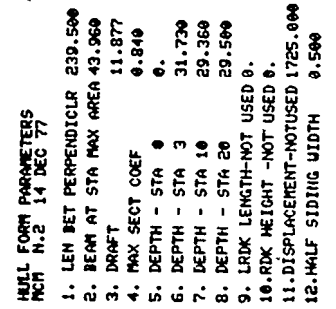


FIG. 3.4.1 HULL FORM PARAMETERS FRAME WITH VALUES TYPED

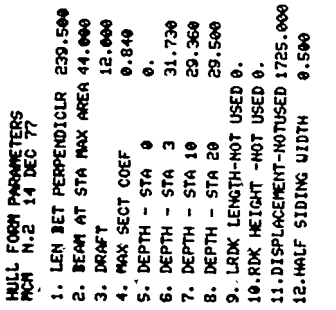


FIG. 3.4.3 HULL FORM PARAMETERS FRAME WITH RESULTS

Examples:

2,44.00	One ID value pair
2,44.00,3,12.00	Two ID, value pairs
2,44.00,3,12.00,1,250.253	Three ID, value parts

3.5 REVIEW SA CURVE:- AREA FRAME

Review section area curve and the parameters that effect its characteristics.

Definitions for Frame - Section Area Curve

1. PRISMATIC COEF - CP

   Non-dimensional' shape coefficient below the DWL. It is defined as the molded volume of displacement/(beam draft* length between perpendiculars X midship section coefficient).

2. LCB - PERCENT LBP

   Longitudinal center of buoyancy expressed as a percent of the length between perpendiculars referenced to midships. A positive value means the center is forward of midships, and a negative value means the center is aft of midships.

3. STA MAX AREA

   The longitudinal location of the section of maximum area expressed as a station location between 0 and 20.

4. STA 0 - AREA

   Ordinate of the section area curve at station 0 (forward prependicular) expressed as a fraction of the maximum section area.

5. STA 0 - SLOPE

   The slope of the section area curve at station 0 (forward perpendicular). It is non-dimensionalised on the maximum section area and the length from station 0 to station 10 (one-half LBP).

6. STA 20 - AREA

   Ordinate of the section area curve at station 20 (aft perpendicular) expressed as a fraction of the maximum section area.

7. STA 20 - SLOPE

   The slope of the section area curve at station 20 (aft perpendicular). It is a non-dimensionalised on the maximum section area and the length from station 10 to station 20 (one-half LBP).

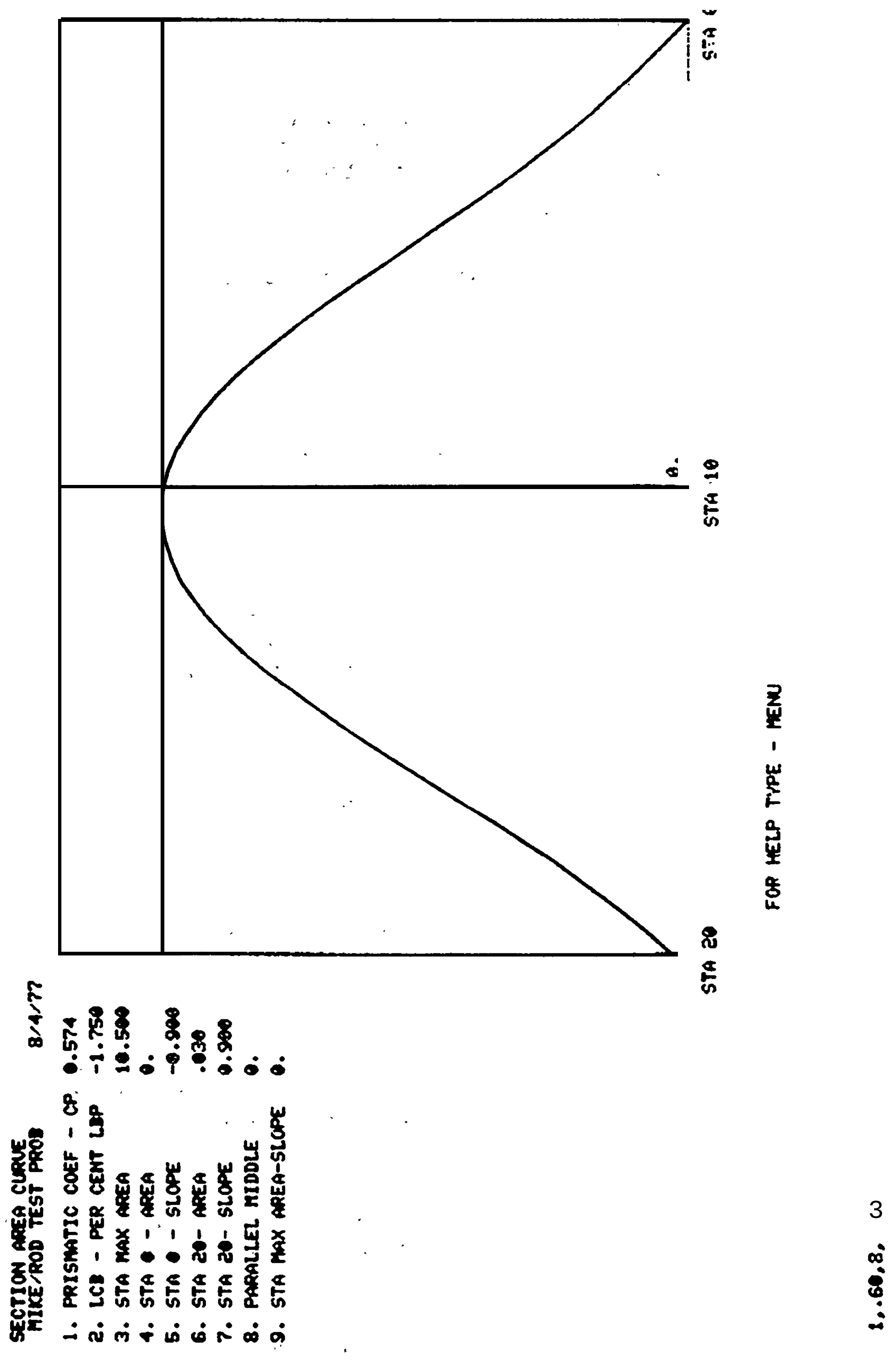


FIG. 3.5.2 SECTION AREA CURVE FRAME WITH VALUES TYPED

8. PARALLEL MIDDLE

The length of an optional flat portion in the section area curve expressed as a fraction of the length between perpendiculars.

9. STA MAX AREA - SLOPE

The slope at the station of maximum area is defined as 0.0. Do not change this value unless some unusual effect is required.

Review Tensor Area - TAREA Frame

The user has available a sensitive method to “fine tune” small changes into the section area by using tensor vector mathematics. Experimentation is required to determine the limits on the parameter alterations allowable.

In This Mode the Following Variables Appear:

Additional Definitions for Frame - Tensor Area Curve

10. TENSOR - STA 0

This parameter expresses the amount of “pull” on the forward part of the curve at station O along a direction line specified by the station O slope.

11. TENSOR - END.FWD SEGMT

This parameter expresses the amount of “push” on the forward part of the curve at the end of the forward segment along a directional line specified by the slope at the station of maximum area.

12. TENSOR - START AFT SEG

This parameter expresses the amount of “pull” on the after part of the curve at the forward end of the segment along a direction line specified by the slope at the station of maximum area.

13. TENSOR - STA 20

This parameter expresses the amount of “push” on the after part of the curve at the after end of the segment along a direction line specified by the slope at station 20.

3.6 REVIEW DWL CURVE - DWL FRAME

Review the non-dimensionalized design waterline and the parameters that affect its shape, area, and centroid of area.

Definitions for Frame - Load Waterline

1. WATER PLANE COEF

   This is the area-coefficient defined by the area of the water plane/(beam X length between perpendiculars).

2. LONG CTR OF FLOAT

   The longitudinal center of area expressed as a fraction of the length between perpendiculars. The center is referenced to station 10 (midships). A positive value means the center is forward of station 10 and a negative value means the center is aft of station 10.

3. STATION MAX OFFSET

   The longitudinal location of the maximum beam expressed as a station location.

4. STATION 0 OFFSET

   The offset at station 0 expressed as a fraction of the maximum beam.

5. STATION O SLOPE

   The slope at station 0 non-dimensionalized on the maximum beam and the length between station 0 and station 10 (one-half LBP).

6. STATION 20 OFFSET

   The offset at station 20 expressed as a fraction of the maximum beam.

7. STATION 20 SLOPE

   The slope at station 20 non-dimensionalized on the maximum beam and the length between station 10 and station 20 (one-half LBP).

8. PARALLEL MIDDLE

   The length of an optional flat portion on the DWL curve expressed as a fraction of the length between perpendiculars.

9. STATION MAX A SLOPE

   The slope on the DWL curve at the station of maximum area non-dimensionalized on the maximum beam and the one-half length between perpendiculars.

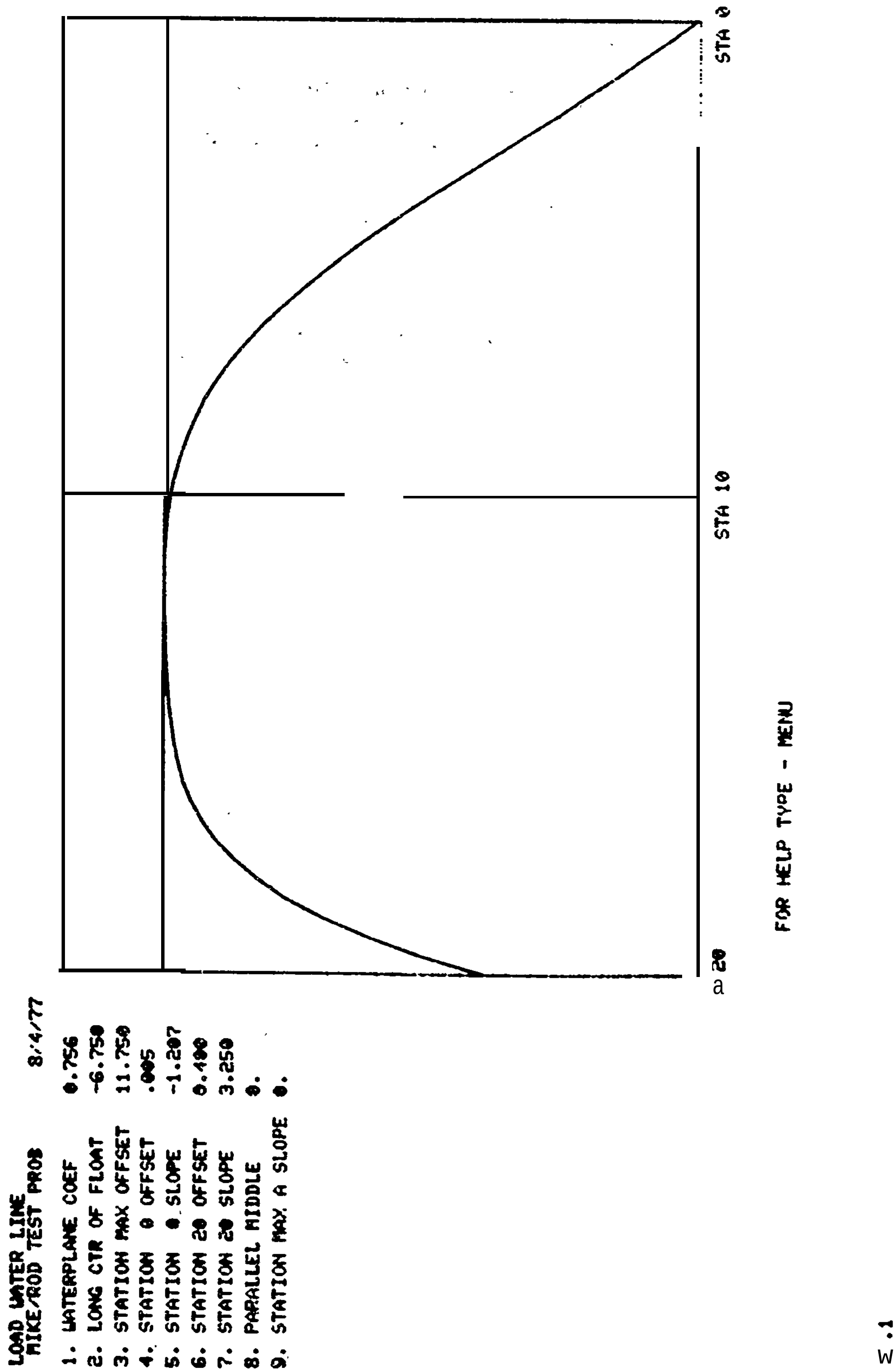


FIG. 3.6.2 LOAD WATER LINE FRAME WITH VALUES TYPED

Review Tensor WL - TDWL Frame

The user has available a sensitive method to “fine tune” small changes into the load waterline by using tensor vector mathematics. Experimentation is required to determine the limits on the parameter alterations allowable. Frame.

In this Mode the Following Additional Variables Appear:

10. TENSOR - STA O

This parameter expresses the amount of “pull” on the forward part of the curve at station O along a direction line specified by the station O slope.

11. TENSOR - END FWD SEGMT

This parameter expresses the amount of “push” on the forward part of the curve at the end of the forward segment along a direction line specified by the slope at the station of maximum area.

12. TENSOR - START AFT SEG

This parameter expresses the amount of “pull” on the after part of the curve at the forward end of the segment along a direction line specified by the slope at the station of maximum area.

13. TENSOR - STA 20

This parameter expresses the amount of “push” on the after part of the curve at the after end of the segment along a direction line specified by the slope at station 20.

3.7 DECK AT EDGE CURVE - EDGE FRAME

Review the non-dimensionalized deck at edge curve including the bow extension forward of station O. The current DWL curve is superimposed so the user can determine flare and tumble-home relations between the two curves.

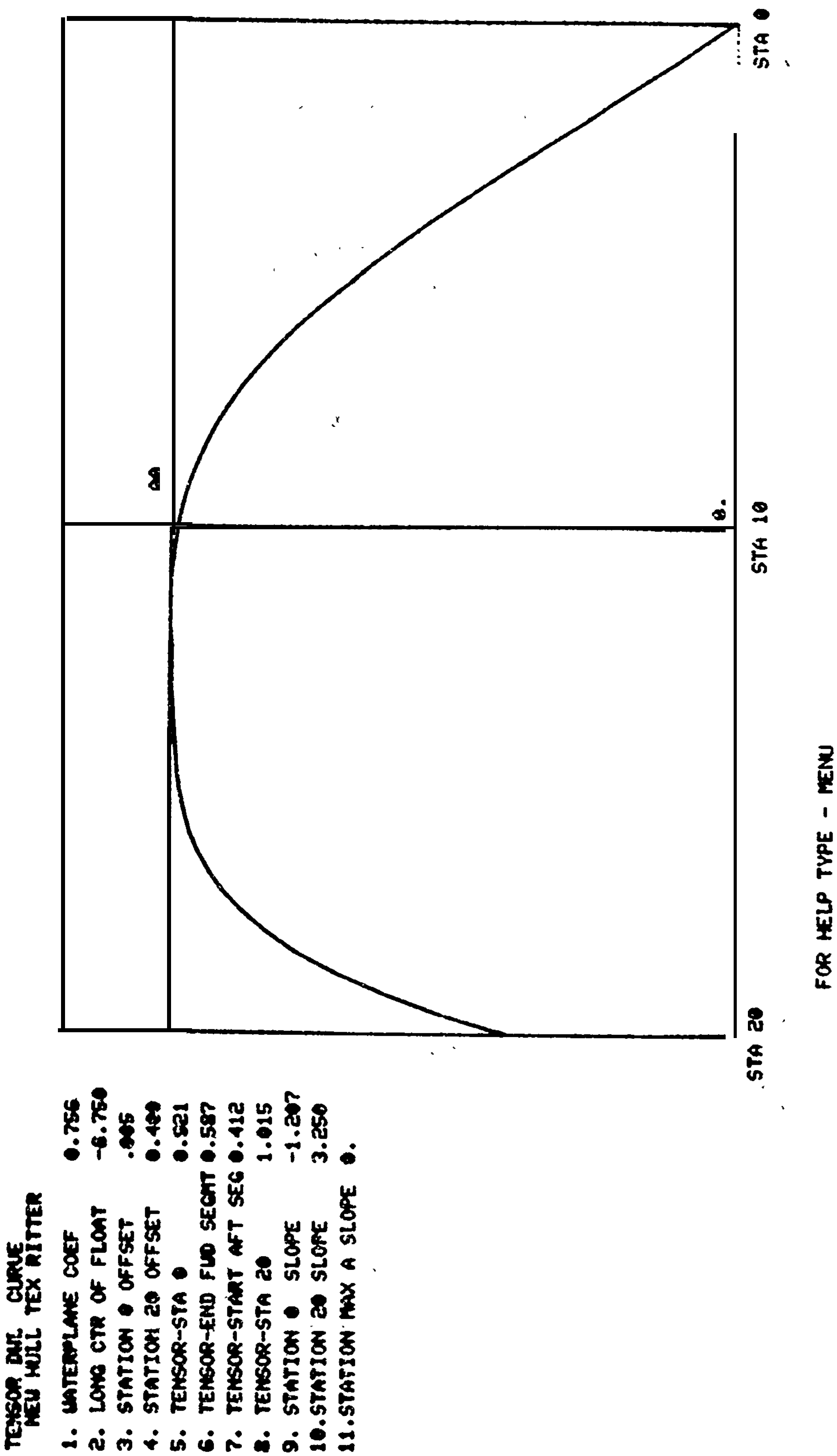
Definitions for Frame - Deck at Edge Curve

1. STATION 20 OFFSET

The offset of the deck curve at station 20 non-dimensionalized on the beam at station of maximum area.

2. STATION 20 SLOPE

The slope of the deck at edge curve at station 20 non-dimensionalized on the beam at station of maximum area and one-half length between perpendiculars.


STA 0
STA 10
STA 20
20
0.
FOR HELP TYPE - MENU
TENSOR DWL CURVE
NEW HULL TEX RITTER
1. WATERPLANE COEF 0.756
2. LONG CTR OF FLOAT -6.750
3. STATION 0 OFFSET .005
4. STATION 20 OFFSET 0.400
5. TENSOR-STA 0 0.521
6. TENSOR-END FWD SEGMT 0.587
7. TENSOR-START AFT SEG 0.412
8. TENSOR-STA 20 1.015
9. STATION 0 SLOPE -1.207
10.STATION 20 SLOPE 3.250
11.STATION MAX A SLOPE 0.

FIG, 3.16

3. STATION 10 OFFSET

The offset of the deck at edge curve at station 10 non-dimensionalized on the beam at station of maximum area.

4. STATION 10 SLOPE

The slope of the deck at edge curve at station 10 non-dimensionalized on the beam at station of maximum area and one-half length between perpendiculars.

5. STATION O OFFSET

The offset of the deck at edge curve at station O non-dimensionalized on the beam at station of maximum area.

6. STATION O SLOPE

The slope of the deck at edge curve at station O non-dimensionalized on the beam at station of maximum area and one-half between perpendiculars.

7. PARALLEL MIDDLE

Length of optional flat portion on curve expressed as a fraction of the length between perpendiculars.

8. STATION AT PAR MIDDL

Longitudinal position of center of parallel middle expressed as a station location between O and 20.

9. BOW OVERHANG

Length of bow overhang forward of station O expressed as an absolute dimension, i.e., 20 feet, or as a fraction of the length between perpendiculars. A value less than 1.0 will be interpreted as a fraction of the length between perpendiculars. A value equal to or greater than 1.0 will be interpreted as an absolute value.

10. STERN OVERHANG

Length of stern overhang aft of station 20 expressed as an absolute dimension, i.e., 20 feet, or as a fraction of the length between perpendiculars. A value less than 1.0 will be interpreted as a fraction of the length between perpendiculars. A value equal to or greater than 1.0 will be interpreted as an absolute value.

11. TRANSOM RADIUS

Not Used.

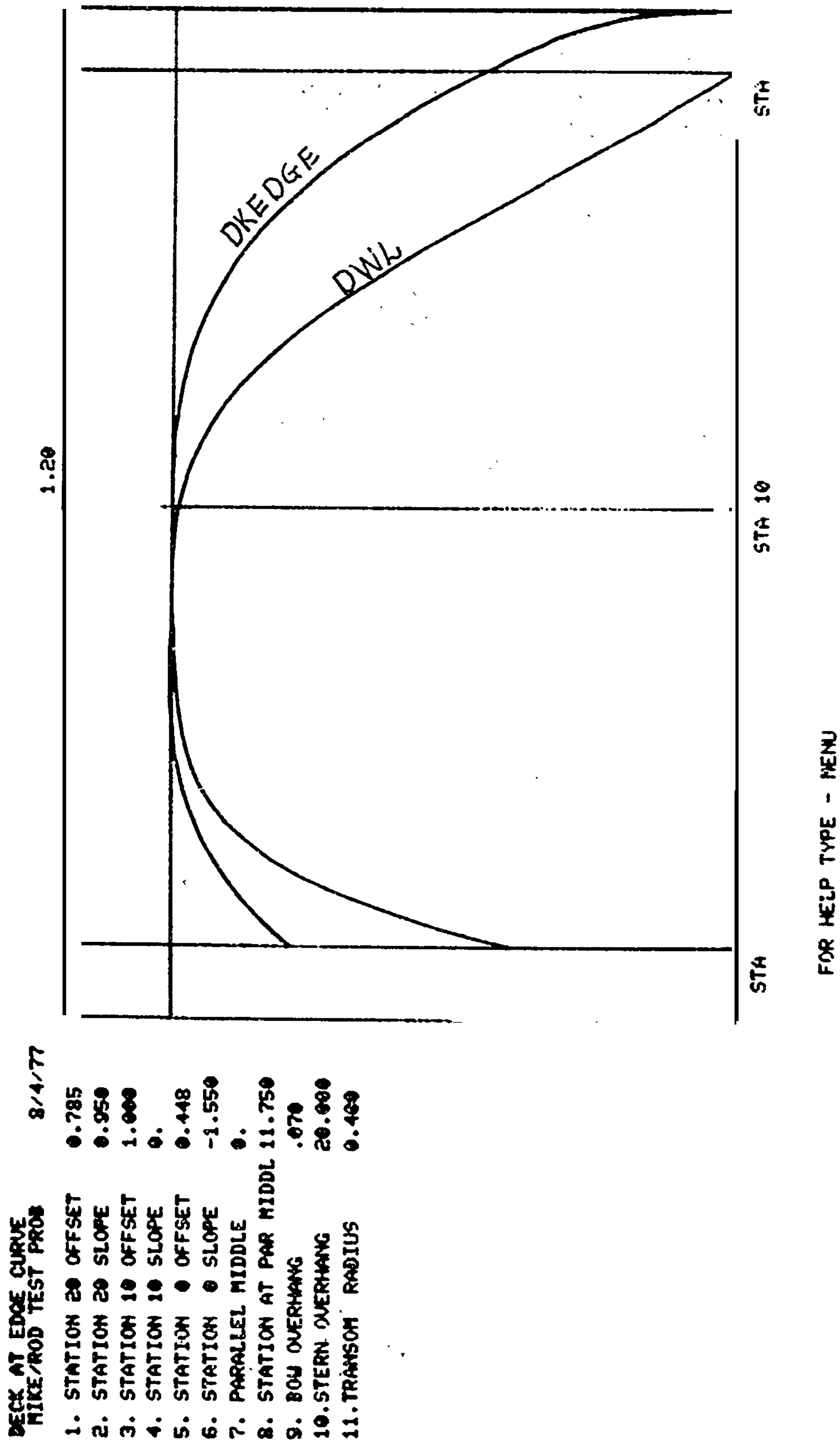


FIG. 3. 7.1 DECK AT EDGE CURVE FRAME

3.8 REVIEW PROFILE CURVE - PROF FRAME

Review inboard profile curve for hull form including sheer line, bow profile, keel rise curve, and stern profile.

Definitions for Frame - Inboard Profile

1. SECTION COEF STA-20

   The local section coefficient at station 20 defined as the area at station 20 divided by the local beam and the local draft.

2. STA OF KEEL RISE

   The longitudinal location of the beginning of the keel rise curve expressed as a station between station 0 and station 20.

3. BOW OVERHANG

   The length of the bow overhang forward of station 0. This length is expressed as,either an absolute length or as a fraction of the length between perpendiculars.

4. DEPTH STA 0

   The depth from the keel line to the sheer curve at station 0 expressed as an absolute dimension.

5. DEPTH STA 3

   The depth from the keel line to the sheer curve at station 3 expressed as an absolute dimension.

6. DEPTH STA io

   The depth from the keel line to the sheer curve at station 10 expressed as an absolute dimension.

7. DEPTH STA 20

   The depth from the keel line to the sheer line at station 20 expressed as an absolute dimension.

8. BOW ANGLE - DEGREES

   The angle of the bow profile as it crosses the DWL expressed in degrees. The user should be aware that the angle produced on display has been non-dimensionalized by draft and one-half length between perpendiculars.

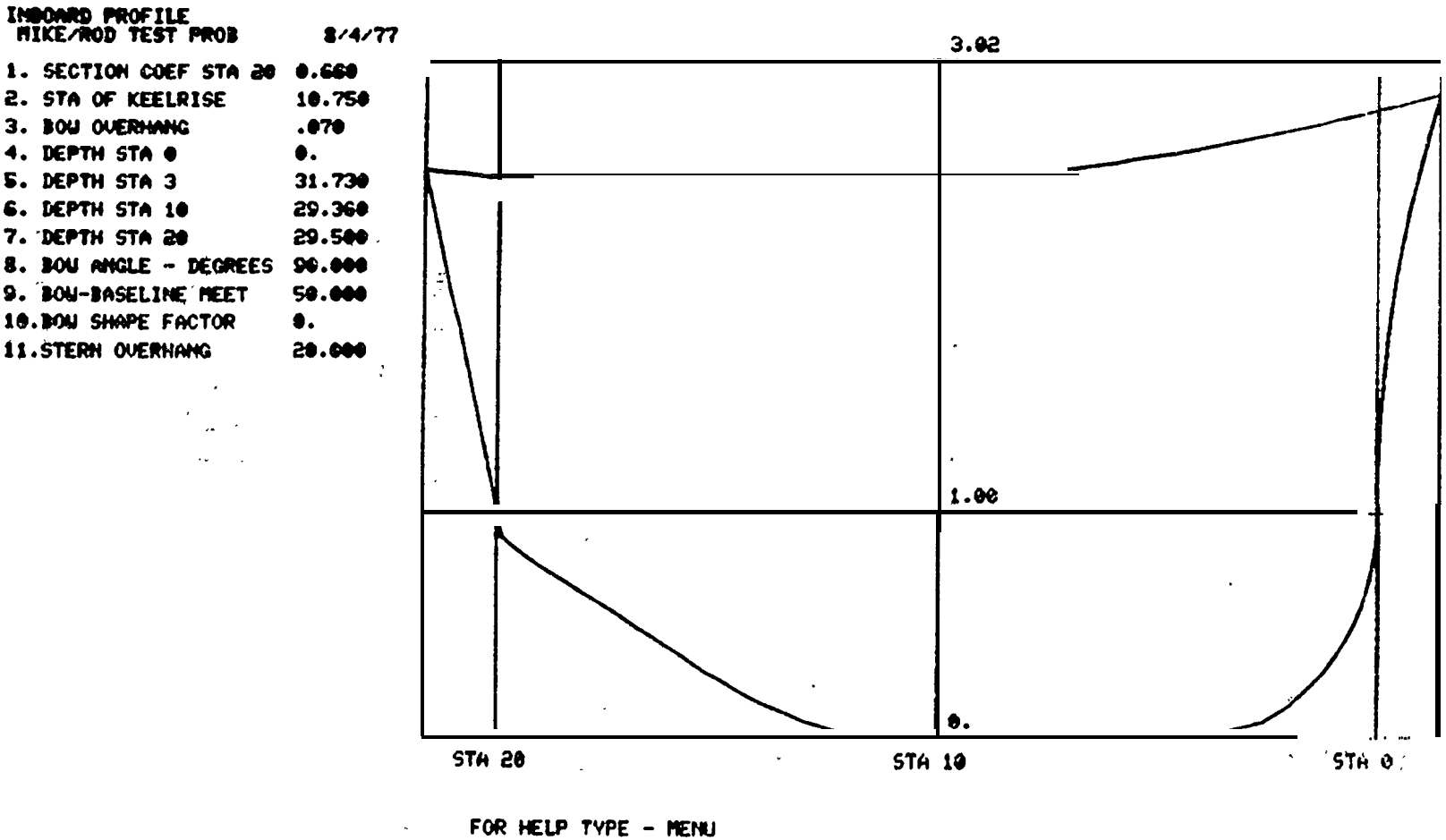


Fig. 3.8.1 INBOARD PROFILE FRAME

9. BOW-BASELINE MEET

The intersection of the bow profile and baseline. It is expressed either as an absolute dimension or as a fraction of the length between perpendiculars.

10. BOW SHAPE FACTOR

This variable affects the resulting shape of the bow profile below the DWL only. Experimentation is required to become acquainted with the effects possible. It is possible to produce bulbous bows and ice breaker type bows by altering this value.

11. STERN OVERHANG

The length of the stern overhang,aft of station 20 is expressed either as an absolute dimension or as a fraction of the length between perpendiculars.

3.9 REVIEW BOTTOM CURVE - FLAT FRAME

Display the half siding and optional flat of bottom curve. The DWL curve is superimposed for comparison.

Definitions of Frame - Flat of Bottom Curve

1. SLOPE-TRANS END

The slope at the intersection of the half siding and the after transition curve. The transition curve connects the midship portion and the half siding curve.

2. STA-START MIDSHIP-

The longitudinal location of the beginning of the midship portion of the flat of bottom curve. The midship portion is defined as the portion of the flat of bottom curve defined exclusively by the radius of the bilge necessary to get a required section area.

3.

The longitudinal location of the end of the midship portion of the flat of bottom curve. The midship portion is defined as the portion of the flat of bottom curve defined exclusively by the radius of the bilge necessary to get a required section area.

4. STA-START TRANSITION

The longitudinal location of the beginning of the transition curve as it leaves the half siding to meet the midship portion of the flat of bottom curve.

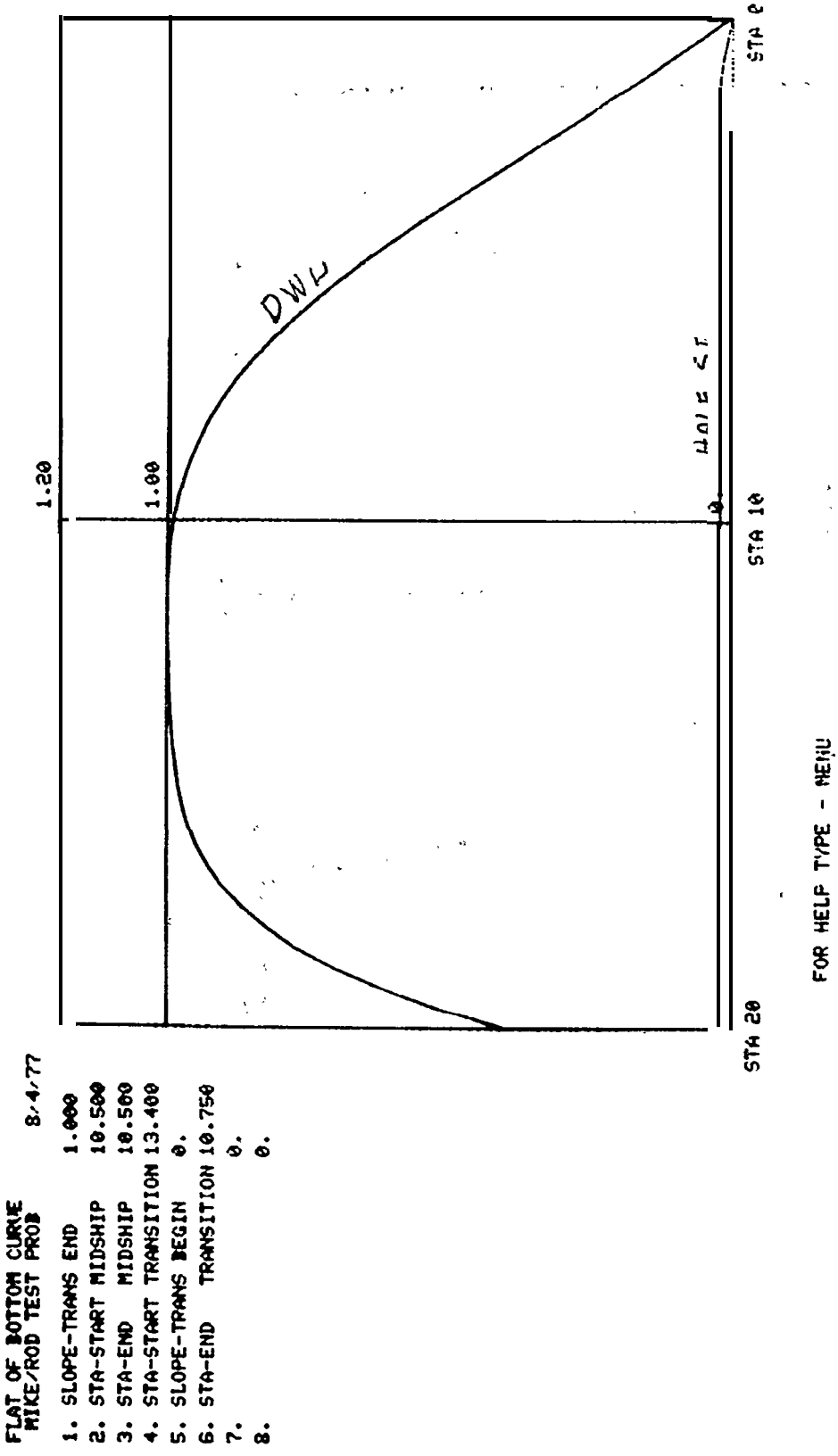
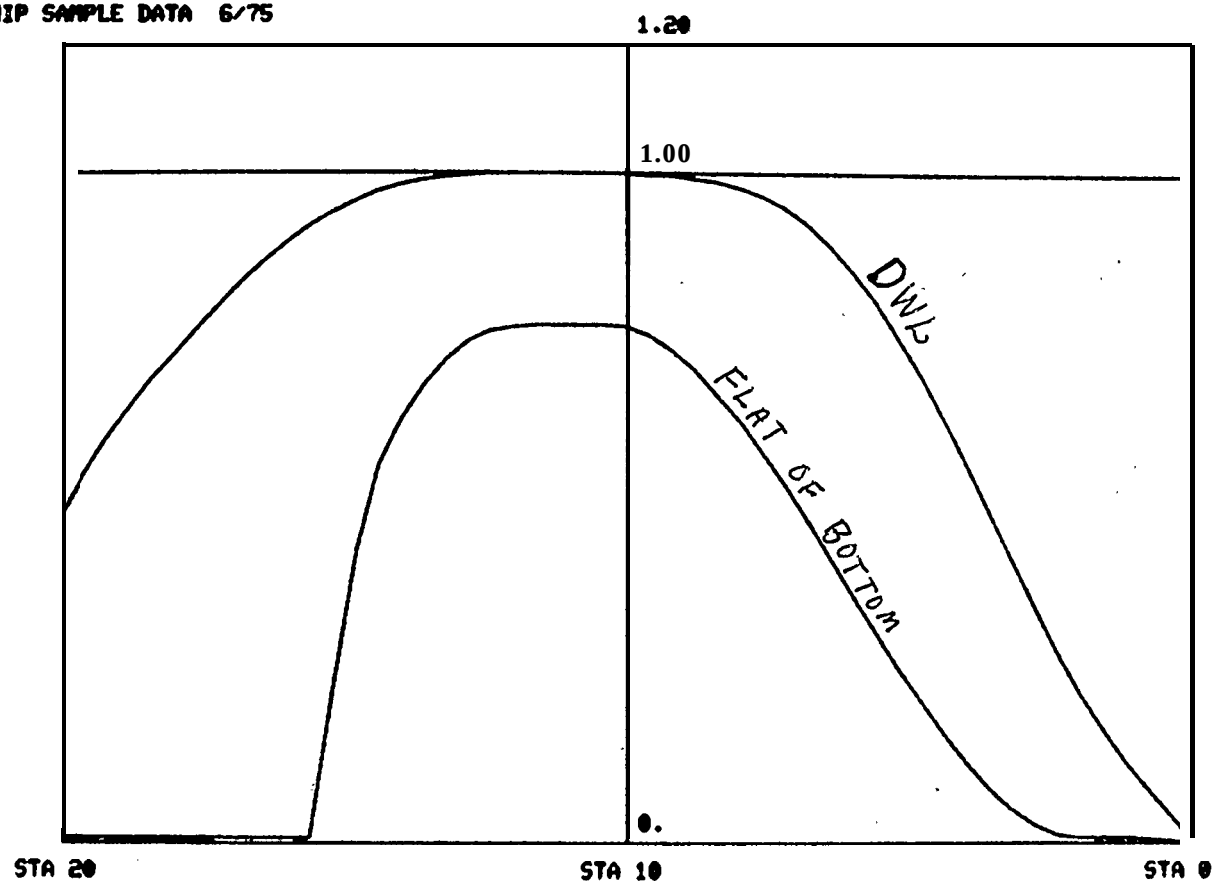


FIG. 3.9. I FLAT OF BOTTOM CURVE FRAME

FLAT OF BOTTOM CURVE
HULLGEN2 AIRCRAFT CARRIER SHIP SAMPLE DATA 6/75

1.	SLOPE-TRANS END	8.000
2.	STA-START MIDSHIP	10.250
3.	STA-ENO MIDSHIP	14.250
4.	STA-START TRANSITION	2.000
5.	SLOPE-TRANS BEGIN	0.
6.	STA-END TRANSITION	15.500
7.		0.
8.		0.



FOR HELP TYPE - MENU

5. SLOPE-TRANS BEGIN

The slope of the transition curve at the point where it intersects with the half siding forward of the midship portion of the flat of bottom curve.

6. STA-END TRANSITION

The longitudinal location of the end of the transition curve as it leaves the midship portion and intersects with the half siding.

7. NOT USED

8. NOT USED

3.10 REVIEW SLOPES - DWL - SWSLP FRAME

Review the longitudinal distribution of section slopes at the design waterline. The slopes are plotted in degrees. O degrees corresponds to a zero slope and 90 degrees corresponds to a vertical slope, i.e., infinite slope.

Definitions for Frame - Slopes at DWL

1. STATION O ORDINATE

Ordinate of slope curve at station O. The units are degrees form O to 180.

2. STATION O SLOPE .

The slope of the slope curve at station O. Non-dimensionalized on one-half length between perpendiculars.

3. STATION 10 ORDINATE

Ordinate of slope curve at station 10. The units are degrees from O to 180.

4. STATION 10 SLOPE

The slope of the slope curve at station 10. Non-dimensionalized on one-half length between perpendiculars.

5. STATION 20 ORDINATE

Ordinate of slope at station 20. The units are degrees from O to 180.

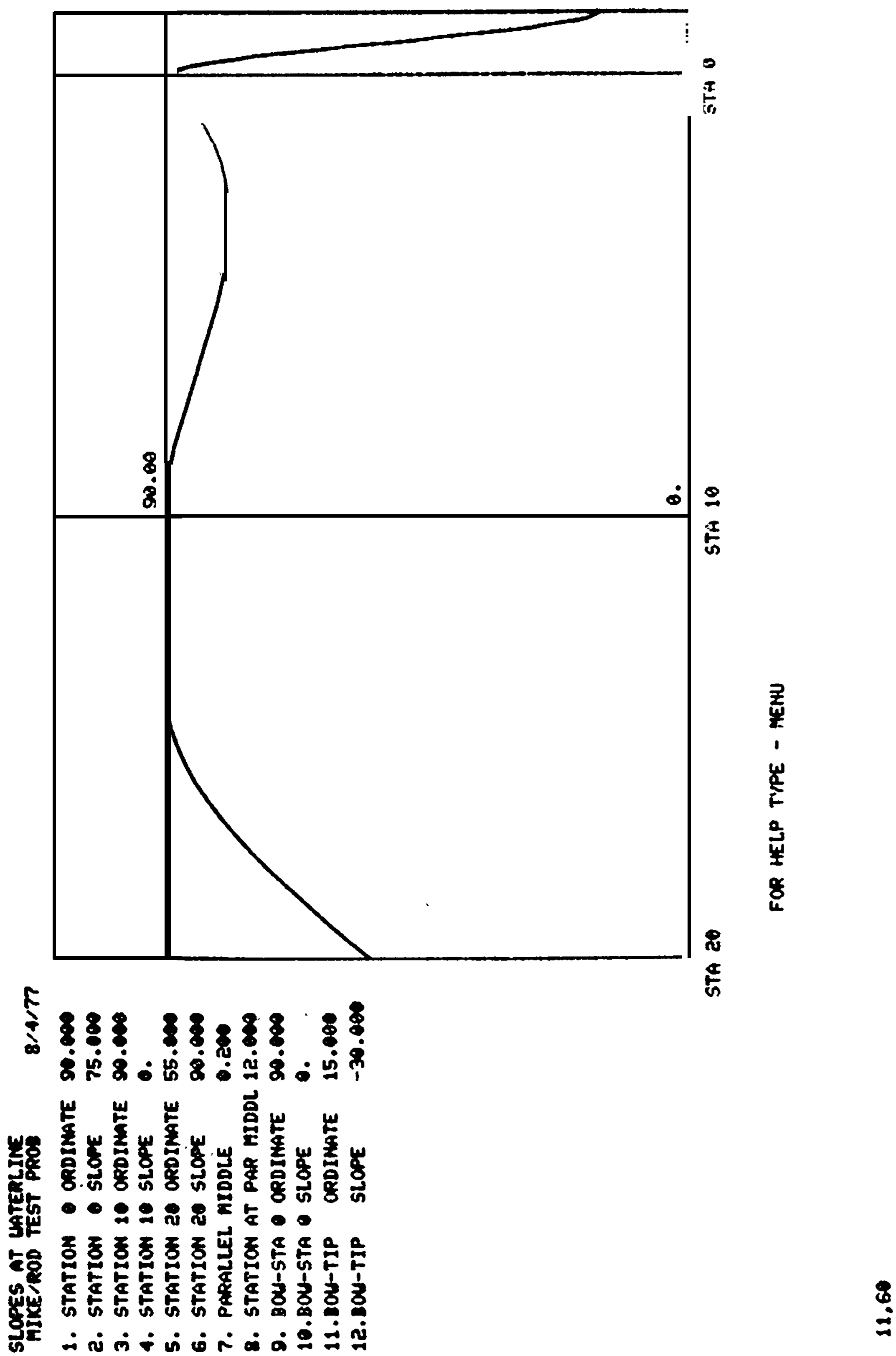


FIG. 3.10.2 SLOPES AT WATERLINE FRAME WITH VALUES TYPED

6. STATION 20 SLOPE

The slope of the slope curve at station 20. Non-dimensionalized on one-half length between prependiculars.

7. PARALLEL MIDDLE

Length of optional flat spot separating the forward and after segments of the slope curve. This parameter-is expressed as a fraction of the length between perpendiculars.

8. STATION OF PAR MIDDL

Longitudinal location of the connection of the forward and after curve segment. This also becomes the center of the parallel middle if specified. This location is expressed as a station location between 0 and 20.

9. BOW-STA 0 ORDINATE

The ordinate for the bow portion slope curve forward of station O at station 0. The units are degrees.

1O. BOW-STA 0 SLOPE

The slope of the slope curve at station O for the bow portion of the curve. This parameter is expressed as non-dimensionalized on one-half length between perpendiculars.

11. BOW TIP-ORDINATE

The ordinate for the bow portion slope curve forward of station O at the bow tip. The units are degrees.

12. BOW TIP-SLOPE

The slope of the slope curve at station 0 for the bow-portion of the curve. This parameter is expressed as non-dimensionalized on one-half length between the perpendiculars.

3.11 REVIEW SLOPES - DEADRS- SDSLP FRAME

Review the longitudinal distribution of section slopes at the baseline. The slopes are plotted in degrees. 0 degrees corresponds to a zero slope and 90 degrees corresponds to a vertical slope, i.e., infinite slope.

Definitions for Frame - Slopes at DEADRS

1. STATION 0 ORDINATE

Ordinate of slope,curve at station 0. The units are degrees from 0 to 180.

2. STATION 0 SLOPE

The slope of the slope curve at station 0. Non-dimensionalized on one-half length between perpendiculars.

3. STATION 10 ORDINATE

Ordinate of slope curve at station 10. The units are degrees from 0 to 180.

4. STATION 10 SLOPE

The slope of the slope curve at station 10. Non-dimensionalized on one-half length between perpendiculars.

5. STATION 20 ORDINATE

Ordinate of slope curve at station 20. The units are degrees from 0 to 180.

6. STATION 20 SLOPE

The slope of the .slope curve at station 20. Non-dimensionalized on one-half length between perpendiculars.

7. PARALLEL MIDDLE

Length of optional flat spot separating the forward and after segments of the slope curve. This parameter is expressed as a fraction of the length between perpendiculars.

8. STATION OF PAR MIDDL

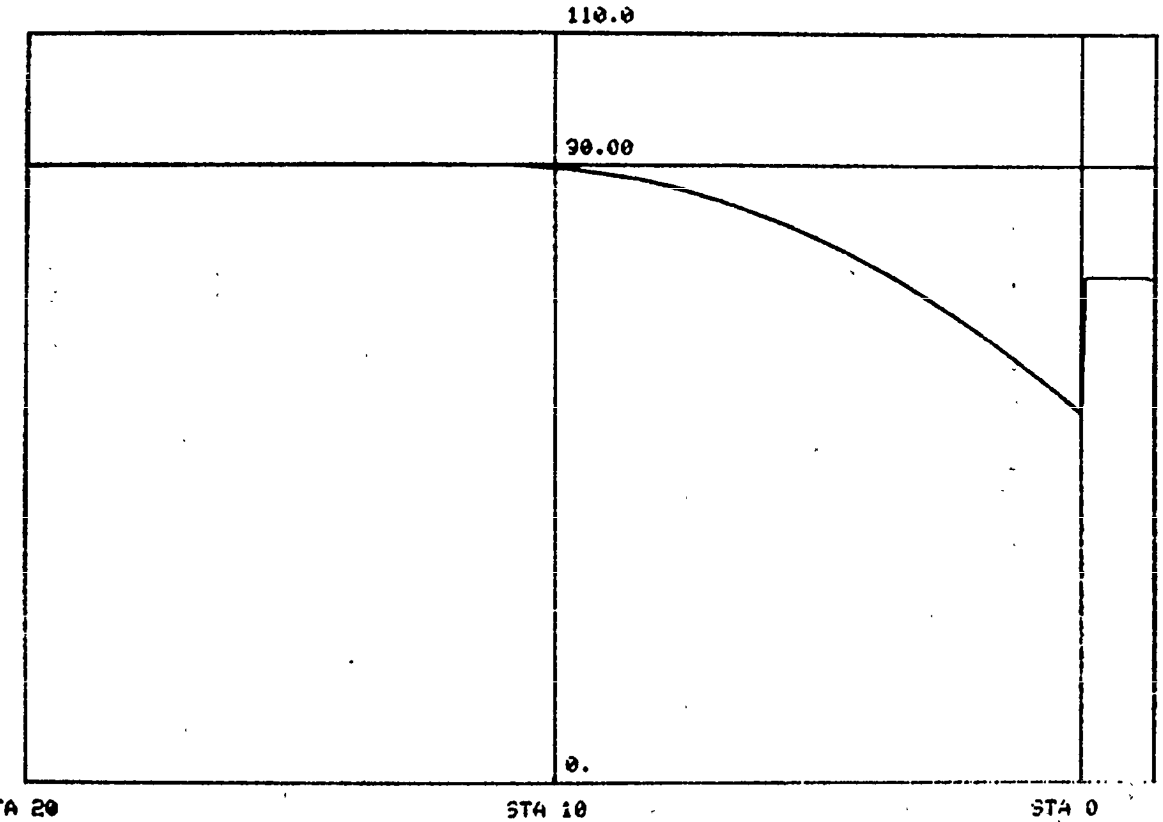
Longitudinal location of the connection of the forward and the after curve segment. This also becomes the center of the parallel middle if specified. This location. is expressed as a station location between 0 and 20.

3.12 REVIEW SLOPES DK EDGE SESLP FRAME

Review the longitudinal distribution of section slopes at the deck edge. The slopes are plotted in degrees. 0 degrees corresponds to a zero slope and 90 degrees corresponds to a vertical slope, i.e., infinite slope.

SLOPES AT DECK EDGE
MIKE/ROD TEST PROB 8/4/77

1.	STATION 0 ORDINATE	54.000
2.	STATION 0 SLOPE	-65.000
3.	STATION 10 ORDINATE	90.000
4.	STATION 10 SLOPE	0.
5.	STATION 20 ORDINATE	90.000
6.	STATION 20 SLOPE	0.
7.	PARALLEL MIDDLE	.100
8.	STATION AT PAR MIDDL	12.000
9.	BOW-STA 0 ORDINATE	73.453
10.	BOW-STA 0 SLOPE	8.179
11.	BOW-TIP ORDINATE	73.453
12.	BOW-TIP SLOPE	-8.179



FOR HELP TYPE - MENU

FIG. 3.12.1 SLOPES AT DECK EDGE FRAME

Definitions for Frame - Slopes at DKEDGE

1. STATION 0 ORDINATE"

   Ordinate of slope curve at station O. The units are degrees from 0 to 180.

2. STATION 0 SLOPE

   The slope of the slope curve at station O. Non-dimensionalized on one-half length between perpendiculars.

3. STATION 10 ORDINATE

   Ordinate of slope curve at station 10. The units are degrees from 0 to 180.

4. STATION 10 SLOPE

   The slope of the slope curve at station 10. Non-dimensionalized on one-half length between perpendiculars.

5. STATION 20 ORDINATE

   Ordinate of slope curve at station 20. The units are degrees from 0 to 180.

6. STATION 20 SLOPE

   The slope of the slope curve at station 20. Non-dimensionalized on one-half length between prependiculars.

7. PARALLEL MIDDLE

   Length of optional flat spot separating the forward and after segments of the slope curve. 'This parameter is expressed as a fraction of the length between perpendiculars.

8. STATION OF PAR MIDDL

   Longitudinal location of the connection of the forward and after curve segment. This also becomes the center of the parallel middle if specified. This location is expressed as a station location between 0 and 20.

9. BOW-STA 0 ORDINATE

   The ordinate for the bow portion slope curve forward of station 0 at station 0. The units are degrees.

10• BOW-STA 0 SLOPE

The slope of the slope curve at station O for the bow portion of the curve. This parameter is expressed as non-dimensionalized on one-half length between perpendiculars.

11. BOW TIP-ORDINATE

The ordinate for the bow portion slope curve forward of station 0 at the bow tip. The units are degrees.

12. BOW TIP-SLOPE

The slope of the slope curve at station O for the bow portion of the curve. This parameter is ‘expressed as non-dimensionalized on one-half length between prependiculars.

3.13 REVIEW BODY PLAN - BODY FRAME

This frame shows the body plan that results from the characteristics of all the curves presented hereto.

Definitions for Frame - Body Plan

1. POINTS BELOW DWL

The number of points used to depict the body plan below the DWL. The minimum number of points' is 3. The-default is 16 points. There is no maximum number of points. The program has a limit, however, on the total number of offsets. This limit is 812.

2. POINTS ABOVE DWL

The number of points used to depict the body plan above the DWL. The minimum number of points is 3. The default is 13 points. There is no maximum number of points. The program has limit, however, on the total number of offsets. This limit is 812.

3. PT DISTRIBUTION BELOW DWL

This parameter determines the distribution of points below, the DWL. A value of 1.0 creates a linear distribution of points. A value greater than 1.0 puts points closer together at the lower end of the curve, near the baseline. A value less than 1.0 but greater than 0.0 puts points closer together at the upper end of ;the curve, near the baseline. The default is 3.0 thereby placing ’points closer together near the baseline.

4. PT DISTRIB ABOVE DWL

This parameter determines the distribution of points above the DWL. A value of 1.0 creates a linear distribution of points. A value

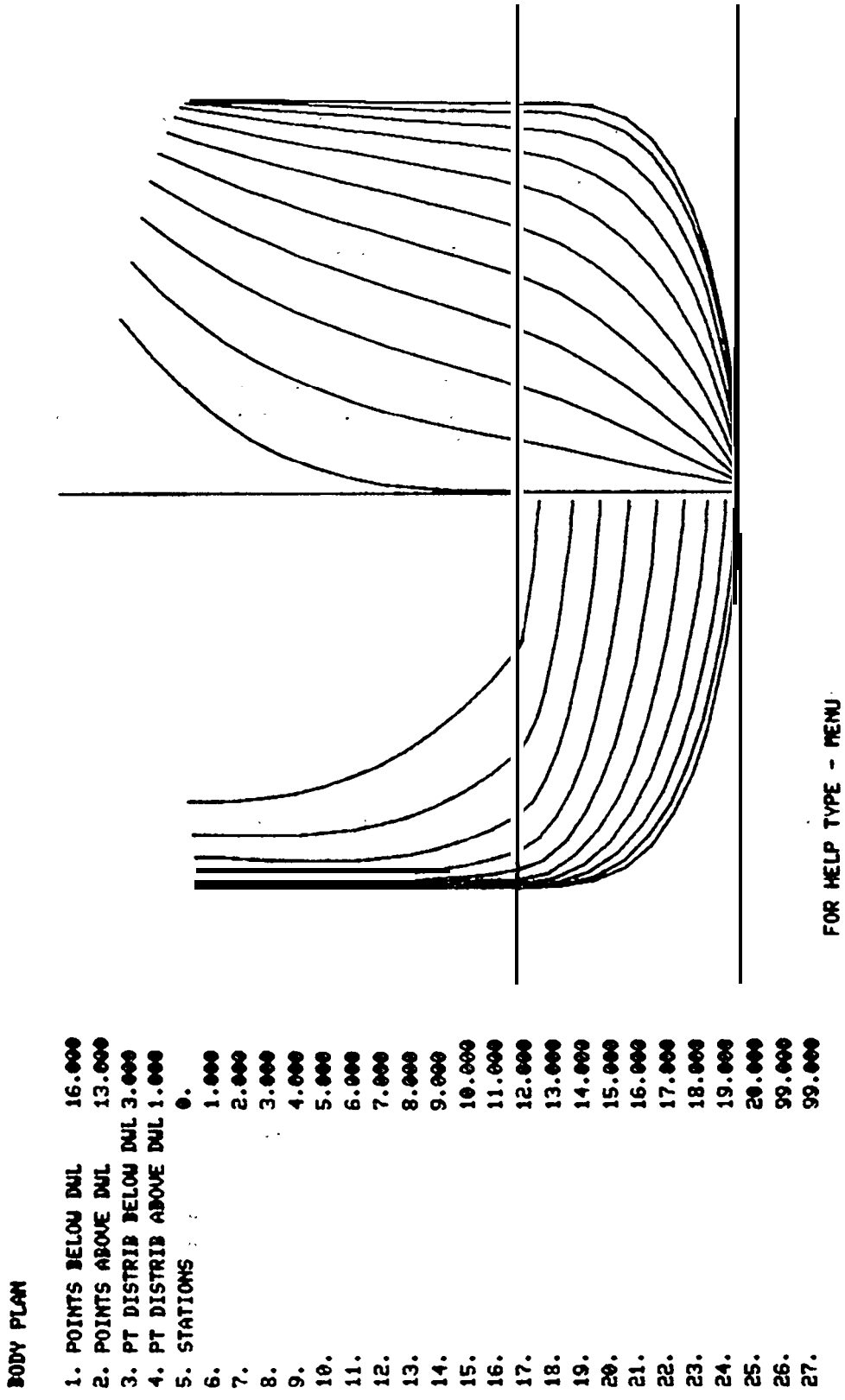
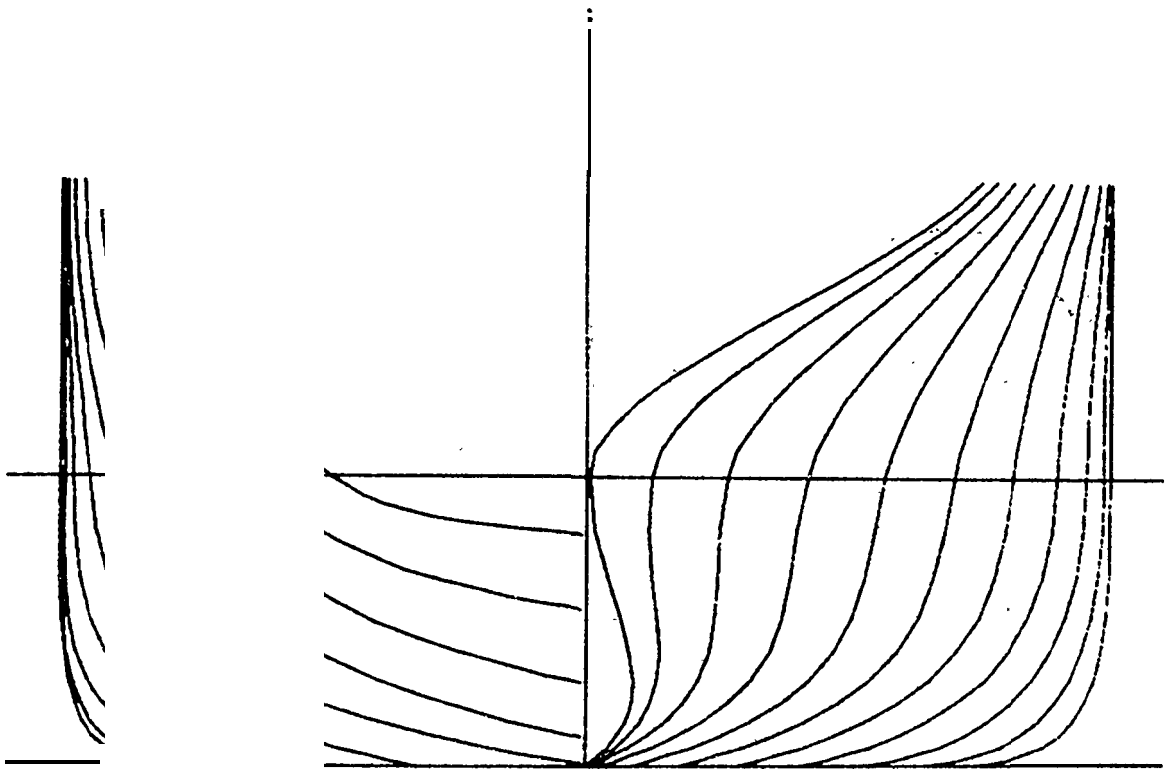


FIG. 3.13.1 800Y PLAN FRAME

BODY PLAN
HULLGEN2 AIRCRAFT CARRIER SHIP SAMPLE DATA 6/75

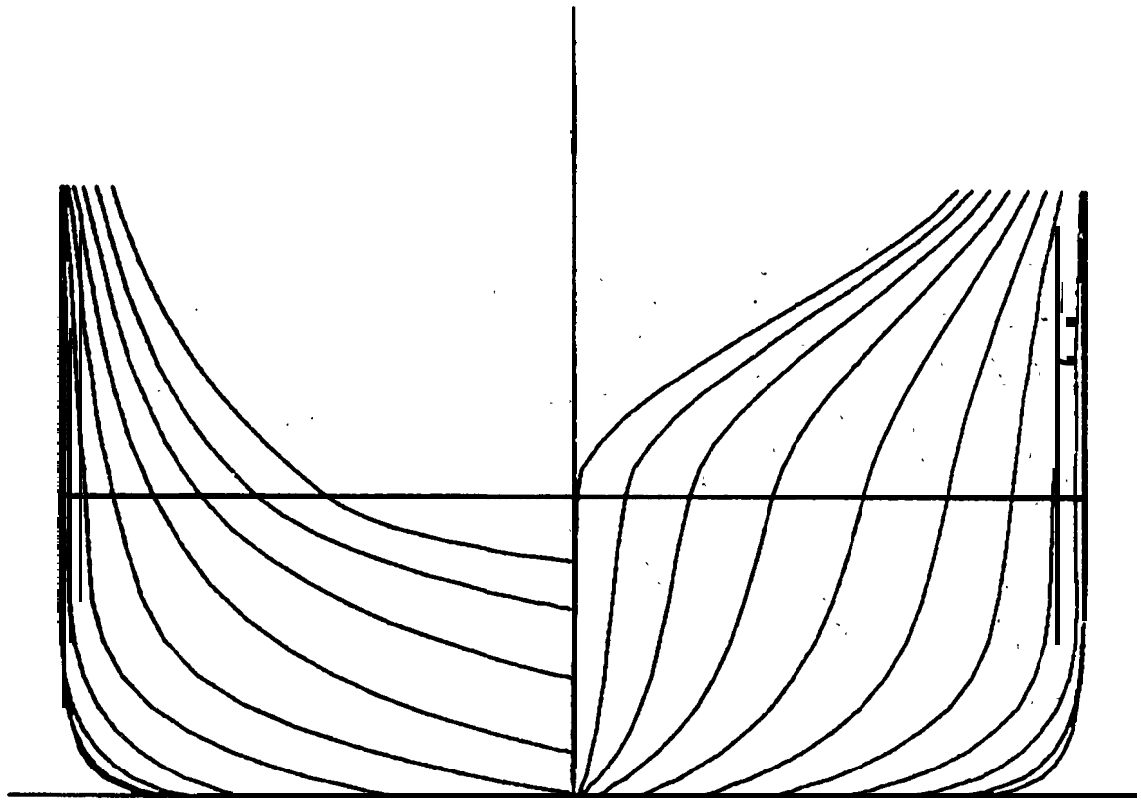
1.	POINTS BELOW DWL	16.000
2.	POINTS ABOVE DWL	13.000
3.	PT DISTRIB BELOW DWL	3.000
4.	PT DISTRIB ABOVE DWL	1.000
5.	STATIONS	0.
6.		1.000
7.		2.000
8.		3.000
9.		4.000
10.		5.000
11.		6.000
12.		7.000
13.		8.000
14.		9.000
15.		10.000
16.		11.000
17.		12.000
18.		13.000
19.		14.000
20.		15.000
21.		16.000
22.		17.000
23.		18.000
24.		19.000
25.		20.000
26.		99.000
27.		99.000



FOR HELP TYPE - MENU

BODY PLAN
HULLGEN2 AIRCRAFT CARRIER SHIP SAMPLE DATA 6/75

1.	POINTS BELOW DWL	16.000
2.	POINTS ABOVE DWL	13.000
3.	PT DISTRIB BELOW DWL	3.000
4.	PT DISTRIB ABOVE DWL	1.000
5.	STATIONS	0.
6.		1.000
7.		2.000
8.		3.000
9.		4.000
10.		5.000
11.		6.000
12.		7.000
13.		8.000
14.		9.000
15.		10.000
16.		11.000
17.		12.000
18.		13.000
19.		14.000
20.		15.000
21.		16.000
22.		17.000
23.		18.000
24.		19.000
25.		20.000
26.		99.000
27.		99.000

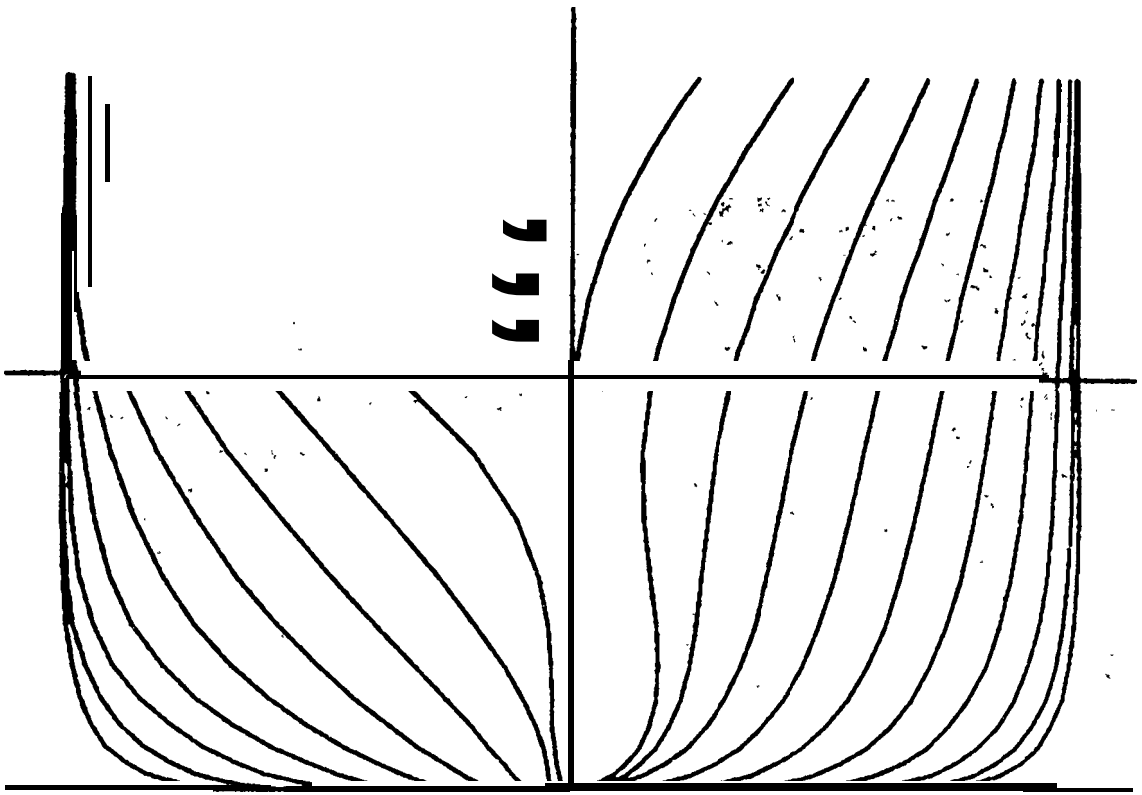


FOR HELP TYPE MENU

BODY PLAN

1.	POINTS BELOW BWL	16.000
2.	POINTS ABOVE BWL	13.000
3.	PT DISTRIB BELOW BWL	3.000
4.	PT DISTRIB ABOVE BWL	1.000
5.	STATIONS	0.
6.		1.000
7.		2.000
8.		3.000
9.		4.000
10.		5.000
11.		6.000
12.		7.000
13.		8.000
14.		9.000
15.		10.000
16.		11.000
17.		12.000
18.		13.000
19.		14.000
20.		15.000
21.		16.000
22.		17.000
23.		18.000
24.		19.000
25.		20.000
26.		99.000
27.		99.000

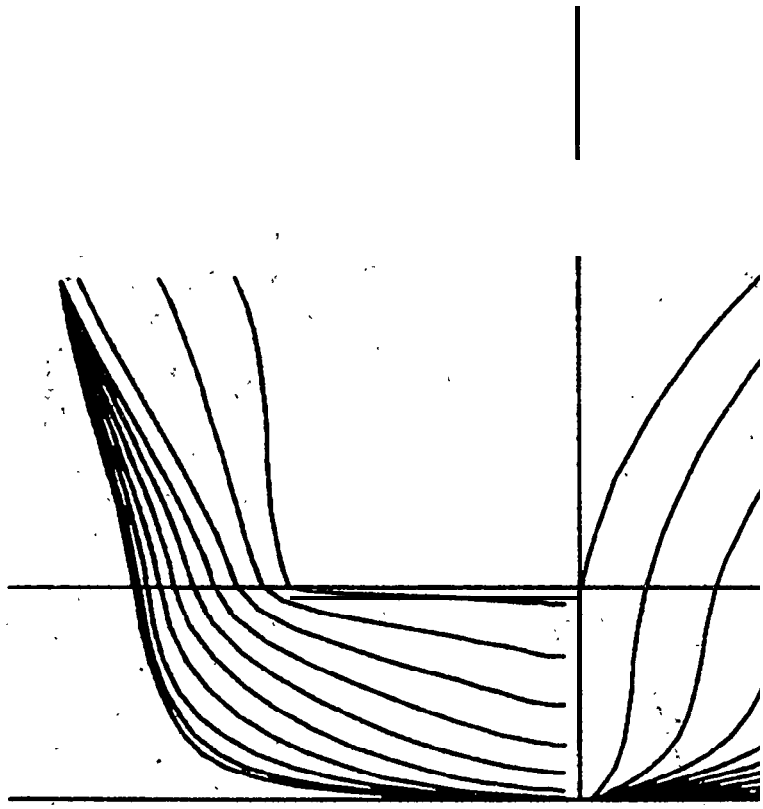
DATA.



FOR HELP TYPE - MENU

DODY PLAN

1. POINTS DELOW DUL	16.000
2. POINTS ABOVE DUL	13.000
3. PT DISTRID BELOW DUL	BELOW DUL 3.000
4. PT DISTRIB ABOVE DUL	WOVE DUL 1.000
5. STATIONS	0 .
6.	1.000
7.	2.000
8.	3.000
9.	4.000
10.	5.000
11.	6.000
12.	7.000
13.	8.000
14.	9.000
15.	10.000
16.	11.000
17.	12000
18.	13.000
19.	14.000
20.	15.000
21.	16.000
22.	17.000
23.	18.000
24.	19.000
25.	20.000
26.	99.000
27.	



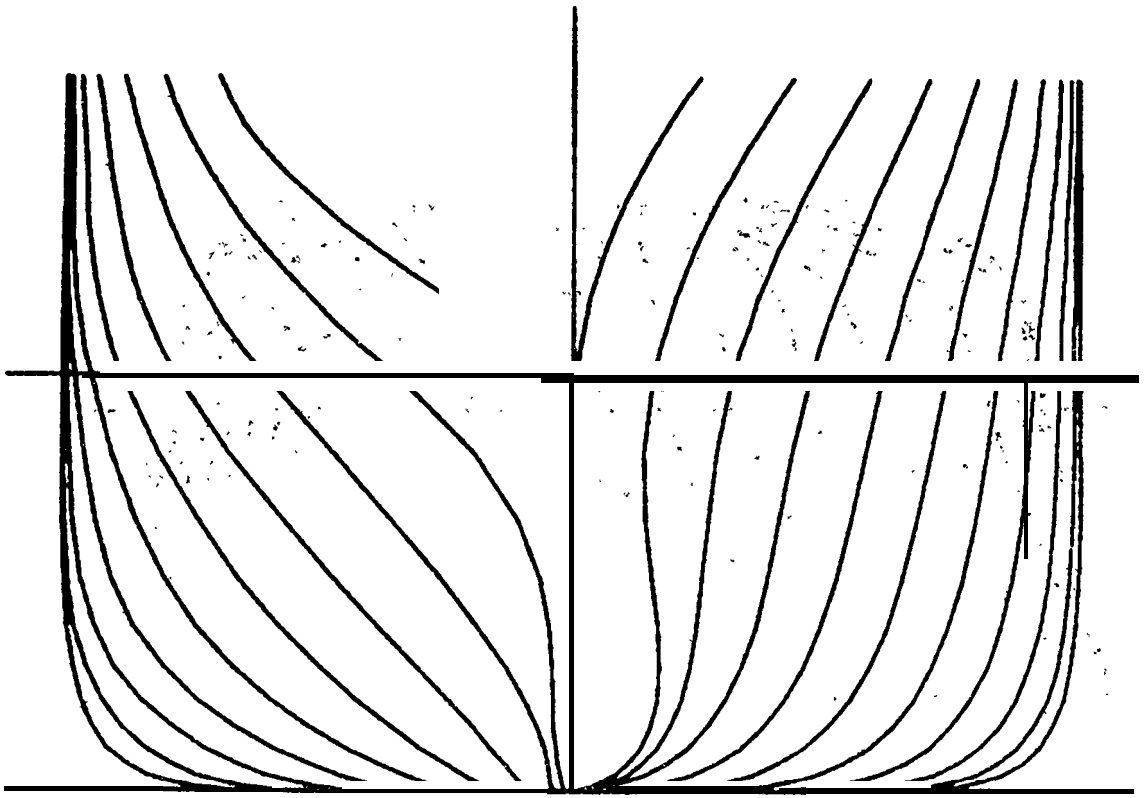
FOR HELP TYPE - MENU

BODY PLAN

1.	POINTS BELOW DWL	16.000
2.	POINTS ABOVE DWL	13.000
3.	PT DISTRIB BELOW DWL	3.000
4.	PT DISTRIB ABOVE DWL	1.000
5.	STATIONS	0.
6.		1.000
7.		2.000
8.		3.000
9.		4.000
10.		5.000
11.		6.000
12.		7.000
13.		8.000
14.		9.000
15.		10.000
16.		11.000
17.		12.000
18.		13.000
19.		14.000
20.		15.000
21.		16.000
22.		17.000
23.		18.000
24.		19.000
25.		20.000
26.		99.000
27.		99.000

DATA.

77?READ DC?

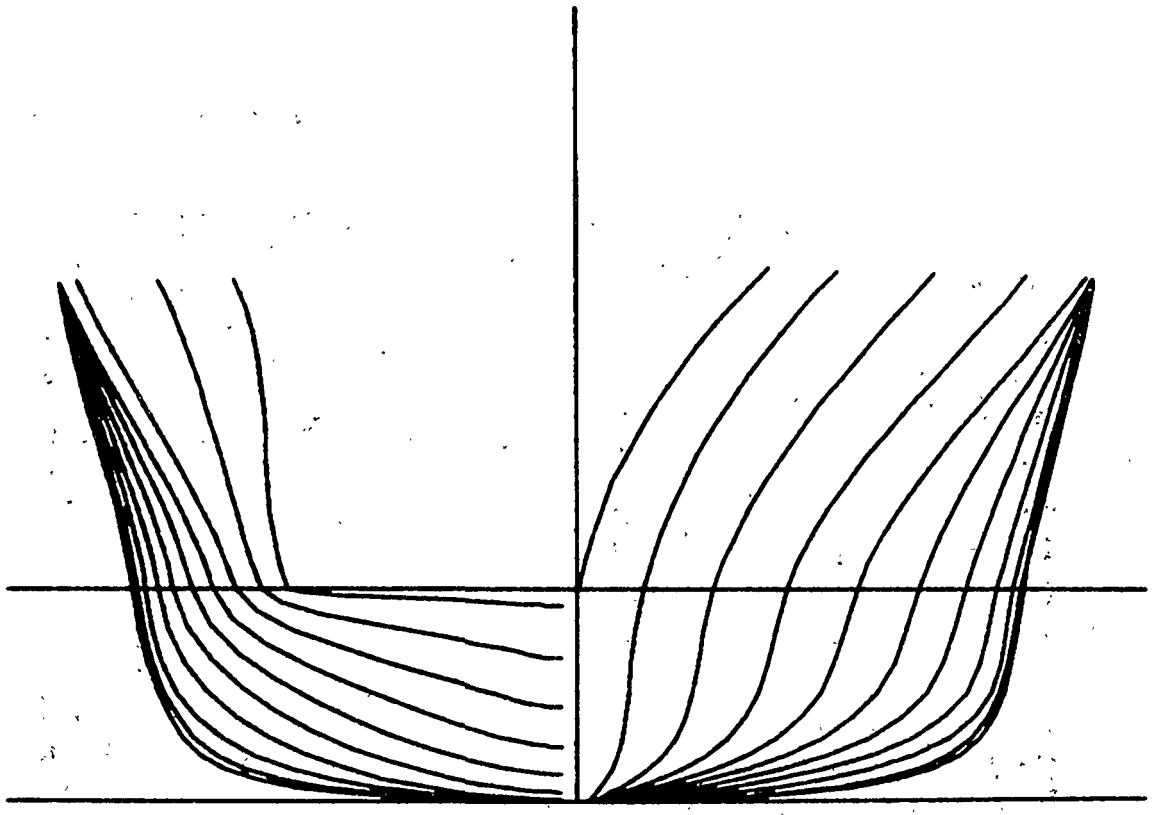


FOR HELP TYPE - MENU

BODY PLAN

1.	POINTS BELOW DWL	16.000
2.	POINTS ABOVE DWL	13.000
3.	PT DISTRIB BELOW DWL	3.000
4.	PT DISTRIB ABOVE DWL	1.000
5.	STATIONS	0.
6.		1.000
7.		2.000
8.		3.000
9.		4.000
10.		5.000
11.		6.000
12.		7.000
13.		8.000
14.		9.000
15.		10.000
16.		11.000
17.		12.000
18.		13.000
19.		14.000
20.		15.000
21.		16.000
22.		17.000
23.		18.000
24.		19.000
25.		20.000
26.		99.000
27.		99.000

AF



FOR HELP TYPE - MENU

greater than 1.0 puts points closer together at the lower end of the curve, near the deck at edge. A value less than 1.0 but greater than 0.0 puts points closer together at the upper end of the curve, near the DWL. The default is 1.0 for a linear distribution of points.

5. TO 33. STATIONS

The longitudinal locations of sections expressed as a station location from O to 20. The values are not limited to integer values. Negative stations, i.e., forward of station O are-acceptable. Stations aft of station 20 are not allowed in this version of the program. Any number of stations up to a maximum of 28 are allowed. A 99.000 indicates that at least one additional station location is available to the user.

3.14 REVIEW OUTPUT OPTIONS - OUT FRAME

The USEF has several options available as to the distribution and types of output he wishes to generate.

The outputs requested are produced only upon exit from the program. This means that only one body plan can be created per each running of the program. The ease with which the program can be re-executed directly from the terminal makes this a minor inconvenience.

Definitions for Frame - Review Output Options

1. PLOT BODY PLAN

Setting this option to 1.0 will produce a scaled CALCOMP plot upon termination of the program. The scale for the plot can be set by setting the plot scale (identification number 14.) to desired value.

2. PUNCH OFFSETS

Punched offsets can be created upon the termination of the program. These offsets are compatible with other naval architecture programs such as SHPC and SAP.

3. PRINT OFFSETS

The offsets can be printed if desired.

4. PUNCH BND COND 1 + 2

The boundary condition values can be punched on cards for some future execution of the program.

5. PRINT BND COND 1 + 2

The boundary condition. values can be printed, if desired.

6. PRINT SA + DWI INFO

Detailed information on the section area curve and--load waterline curve can be printed if desired.

7. PRINT HYDROSTATICS

Very basic hydrostatics regarding stability. and centers of bouyancy at the design condition can be printed out.

8. NOT USED '

9. PRINT MIT SEAKEEPING

Data for the MIT eakeeping program can be created and printed out. Warning....be very careful with this output. The coding assumes the old version of the program with 20 stations and 29 points per station. The program may be required to run as the old version to produce valid results.

10. PUNCH MIT SEAKEEPING

Data for the MIT seakeeping program can be created and punched out in a format for direct input. Please check warning in Item No. 9 above about possible restrictions to valid results.

11. PRINT YFL7 SEAKEEPING

Data for the YF17 seakeeping, program can be created and printed out. Please check the warning in Item No. 9 above about possible restrictions to valid results.

12. PUNCH YF17 SEAKEEPING

Data for the YF17 seakeeping program can be created and punched out in a format for direct input. Please check warning in Item No. 9 above about possible restrictions to valid results.

13. ADD SHIP TO INPUT

This is a new option designed to make it possible to extend the input data file without resorting to punched cards. Setting this option creates a new file of input data consisting of the old data plus the boundary conditions for the current body plan. This file has the temporary file name NEWDA. The cataloged procedure saves this file for future use by cataloging it onto permanent file space.

```
REVIEW OUTPUT OPTNS
 MIKE/ROD TEST PROB        8/4/77

1. PLOT BODY PLAN       0.
2. PUNCH OFFSETS        0.
3. PRINT OFFSETS        0.
4. PUNCH BND COND 1+2   0.
5. PRINT BND COND 1+2   0.
6. PRINT SA +DWL INFO   1.000
7. PRINT HYDROSTATICS   0.
8. NOT USED             0.
9. PRINT MIT SEAKEEPING 0.
10.PUNCH MIT SEAKEEPING 0.
11.PRINT YF17 SEAKEEPNG 0.
12.PUNCH YF17 SEAKEEPNG 0.
13.ADD SHIP TO INPUT    0.
14.PLOT SCALE IN/FT     .100

                                        FOR HELP TYPE - MENU

 1,1,3,1,7,1
1,1,3,1,7,1
```

F13. 30.14.1 REVIEW OUTPUT OPTIONS

```
REVIEW OUTPUT OPTNS
 MIKE/ROD TEST PROB        8/4/77

1. PLOT BODY PLAN       1.000
2. PUNCH OFFSETS        0.
3. PRINT OFFSETS        1.000
4. PUNCH BND COND 1+2   0.
5. PRINT BND COND 1+2   0.
6. PRINT SA +DWL INFO   1.000
7. PRINT HYDROSTATICS   1.000
8. NOT USED             0.
9. PRINT MIT SEAKEEPING 0.
10.PUNCH MIT SEAKEEPING 0.
11.PRINT YF17 SEAKEEPNG 0.
12.PUNCH YF17 SEAKEEPNG 0.
13.ADD SHIP TO INPUT    0.
14.PLOT SCALE IN/FT     .100

                                        FOR HELF
```

FIG. 3.14.2 REVIEW OUTPUT OPTIONS WITH RESULTS

14. PLOT SCALE IN/FT

Set the scale for CALCOMP plots if Item 1. is set above. The default is .100 inches/foot. Note - the ship is non-dimensional internal to the program, therefore the scale could be considered as inches/meter, inches/yards, etc.

3.17 PROGRAM STOP - STOP

The stop option ends execution of the program. Prior to the actual end of the program, any output options that have beep requested by the user are carried out. The data for the hull created just prior to the stop command is used for the outputs requested. This includes the addition of data to the input data file if requested by the user.

3.18 RESTORE OLD CURVE - OLD

Typing old in any frame reproduces the data and curve as it existed upon entering the frame.

This means that if more than one change is made within the frame, the values of the data for restoration are those that existed upon entering the frame.

3.19 CHANGE TITLE - TITLE

To change the title at any time - Type title and the new title desired.

Examples: Title - THE NEW HULL 17 APRIL 1978
Title - VERSION NO. 2 RUN NO. 25

5.1 PLANS FOR FUTURE IMPROVEMENTS

This section lists the suggestions for additions or improvements that are considered feasible for this program. The order of presentation does not necessarily indicate any particular priority for implementation.

The user with a hot idea should scan this list to see if his idea is already on the list. If it is not, call F, R. Bjorklund (202) 692-8160 to have it included in the list.

There is no set schedule for implementation of new features. They will be taken care of when time permits.

1. What happened to the read boundary conditions without override?
ANS: Good question. I forgot.

REFERENCES.

1. Fuller, A. L., Bjorklund, F. R., Ship hull form generation using interactive graphics, Naval Ship Engineering Center, NAVSEC 6114B2, Washington, D.C. 20362.

2. Fuller, A. L., Billingsley, D. W., Aughey, M. A., Computer aided ship hull definition at the Naval Ship Engineering Center, September 1978, Proceeding of the SCHAD'77 , computer aided hull surface definition symposium, the Society of Naval Architects and Marine Engineers, One World Trade Center, New York, N.Y.